

ADDITIONS TO THE FLORA OF
NEWFOUNDLAND. III.

STUART G. HAY, ANDRÉ BOUCHARD,
AND LUC BROUILLET

ABSTRACT

Five significant additions of arctic and subarctic species have been made to the native vascular flora of the island of Newfoundland as a result of botanical explorations on the Great Northern Peninsula: *Minuartia biflora* (Wats.) Schinzl. & Thell., *Primula stricta* Hornem., *Sagina caespitosa* (J. Vahl) Lange, *Sagina saginoides* (L.) Karst. and *Salix argyrocarpa* Anderss. Important range extensions on the island are also reported for *Cerastium terrae-novae* Fern. & Wieg., *Danthonia intermedia* Vasey and *Salix arctica* Pallas.

Key Words: vascular flora, arctic and subarctic additions, Newfoundland

Studies on the flora of the island of Newfoundland have taken an important turn recently with the publication of a repertoire with distribution maps of the "Rare Vascular Plants of the Island of Newfoundland" (Bouchard et al., 1991), and a general "Atlas of the Vascular Plants of Newfoundland and the Islands of Saint-Pierre-et-Miquelon" (Rouleau and Lamoureux, 1992). Knowledge of the flora of this insular region of Atlantic Canada continues to progress, but as both of these publications point out, there is still room for work to be done to gain a fuller understanding of the region.

We have already made evident in earlier papers on new records to the flora of Newfoundland (Hay et al., 1990, 1992) that many parts of the island are relatively inaccessible, and have yet to be thoroughly surveyed botanically. Further exploration of these areas is bound to result in exciting new discoveries, range extensions, and to fill in gaps in the presently-known distribution patterns of plants on the island.

In 1992, we pursued our floristic investigations of Newfoundland, particularly of the rare plants, in two areas located at the tip of the Great Northern Peninsula. This area is already known for its important arctic-alpine flora, much of which is rare because of its very restricted distribution on the island. During our field investigations, five remarkable arctic or subarctic species were collected for the first time in Newfoundland. This report includes notes on their distributional range, their habitat, and the phyto-

geographical significance of the new records. All five species make significant additions to both the list of rare plants of Newfoundland (Bouchard et al., 1991) and the recent atlas of the flora of Newfoundland (Rouleau and Lamoureux, 1992).

L'Anse-aux-Meadows

Two species new to Newfoundland were discovered in L'Anse-aux-Meadows National Historic Park, on Sacred Bay, where we conducted a survey of the rare vascular plants for Parks Canada (Bouchard et al., 1993). The park is classified as a World Heritage Site by UNESCO because of its cultural significance as the earliest known Norse landing and settlement site in the New World.

Primula stricta Hornem.

SPECIMENS. Strait of Belle Isle Dist.: L'Anse-aux-Meadows National Historic Park, between Upper Quarter Deck Cove and Rudder Cove, 1992/08/08, *Bouchard, Hay & Brouillet 92018* (CAN, COCO, MT).

The distribution of *Primula stricta* extends throughout the southern islands of the Canadian Arctic Archipelago, into the Hudson Bay region and along parts of coastal Ungava and northern Labrador. It is an arctic amphi-Atlantic species that ranges eastward through Greenland and Iceland to Scandinavia (Hultén, 1958; Kelso, 1991). Confusion with other allied species in section *Aleuritia*, namely *Primula anvilensis* S. Kelso, *P. borealis* Duby and *P. incana* M. E. Jones, have, until recently, obscured the true distribution of this species (Kelso, 1991). The only reports of it from Labrador are restricted to the northern coastal area of the Peninsula (Morisset and Payette, 1987; Kelso, pers. comm.).

At the L'Anse-aux-Meadows site, plants of *Primula stricta* were discovered in an open, partly herbaceous *Empetrum* heath community that covered a flat, supralittoral, gravel terrace behind the landwash along a seashore beach. This appears to be typical of the habitat generally observed for the species throughout its range. The plants were past anthesis when collected and were mistaken for efarinose specimens (f. *chlorophylla* Fern.) of *Primula laurentiana* Fern. These two species can be confused, especially where their ranges overlap. No field information was recorded on the size of the colony.

The L'Anse-aux-Meadows record of *Primula stricta* is an important extension southward of the species' range along the Atlantic coast, in comparison with localities in northern Labrador. The origin of the present-day, ampho-Atlantic distribution pattern is still unclear. *P. stricta* is a 14-ploid species that could have derived from either European or North American progenitors. The polyploid complex stems from the postglacial migration and concatenation of ancestral populations following Pleistocene glaciation (Kelso, 1991).

Salix argyrocarpa Anderss. (Syn.: *S. ambigua* Tuckerm., *S. labradorica* Schw.)

SPECIMENS. Strait of Belle Isle Dist.: L'Anse-aux-Meadows National Historic Park, along boardwalk between interpretive center and Norse archaeological site, 1992/08/07, *Bouchard, Hay & Brouillet 92001* (CAN, GH, MT)

Endemic to northeastern North America, the range of *Salix argyrocarpa* lies mainly in the northern subarctic regions of the Québec-Labrador Peninsula, with only a few, more southerly localities extending from the eastern James Bay coast to the Côte-Nord of the Gulf of St. Lawrence (Morisset and Payette, 1987; Raup, 1943). Rare and disjunct occurrences appear southward in alpine and subalpine situations in the Shickshock Mountains of the Gaspé Peninsula in Québec and in the New England states of Maine (Mt. Katahdin) and New Hampshire (Mt. Washington) (Crow, 1982; Raup, 1943).

At L'Anse-aux-Meadows, a single colony of this willow was discovered growing in an alder-willow thicket in a zone of heavy snow accumulation. The scrub community was found on sloping, soggy ground below a low, northeast-facing cliff in the bedrock. Less than ten clones were counted in the population.

The Newfoundland population of *Salix argyrocarpa* marks the eastern limit of the species' compass. Although the type of snowbed habitat where it was found may be ecologically restrictive, it seems surprising that this willow has never been recorded on the island. With further search, we would expect it to be found elsewhere in suitable alpine and subalpine sites in the Long Range Mountains and at the tip of the Northern Peninsula.

White Hills Mountains

Three species new to Newfoundland, all Caryophyllaceae, have been discovered in the White Hills Mountains to the west of St. Anthony. The White Hills form two adjoining plateau-like massifs of ultramafic, serpentized peridotite and dunite bedrock that lie close to the north shore of Hare Bay. The eastern massif forms a high, barren tableland (alt. 230–300 m) covering a vast area of approximately 100 km². The northern and eastern rims of the plateau are flanked by steep talus slopes that fall away into a chain of long lakes, two of the largest of which are Eastern Long Pond and Western Long Pond. Snowbeds, some of which are late-lying, are a conspicuous feature of these talus slopes.

The White Hills are of the same geological origin as the serpentine complex in the Bay of Islands and Bonne Bay areas that lie approximately 250 km further south on the west coast. The latter tablelands are already well known for their unique serpentine flora that includes some of the rare and more interesting arctic-alpine and endemic elements of Newfoundland (Bouchard et al., 1986, 1991; Dearden, 1979; Roberts, 1992). The White Hills on the Great Northern Peninsula, however, have been less well explored. Three species, *Cerastium terrae-novae* Fern. & Wieg., *Danthonia intermedia* Vasey and *Salix arctica* Pallas, previously known only from the Bay of Islands and Bonne Bay serpentines, were collected here for the first time, and make significant range extensions on the island.

The three Caryophyllaceae new to Newfoundland are:

Minuartia biflora (Wats.) Schinzl. & Thell. (Syn.: *Arenaria sajanensis* Willd. ex Schlecht., *A. biflora* Wats., not L.)

SPECIMENS. Strait of Belle Isle Distr.: White Hills, west of St. Anthony, southwest of Western Long Pond, 1992/08/17, Bouchard, Hay & Brouillet 92386 (CAN, MT).

Minuartia biflora is a circumpolar, arctic-montane species. In North America, in the western half of its range, it extends from the lower islands of the Canadian Arctic Archipelago southward through Alaska, Yukon and the Rocky Mountains of British Columbia to Colorado and Montana. In the eastern half of its range, *M. biflora* is found from the high Arctic to the Hudson Bay region, and is scattered through the arctic and subarctic region of the

Québec-Labrador Peninsula (Morisset and Payette, 1987; Hultén and Fries, 1986). Only one southward disjunct locality has been recorded from the serpentine summit of Mt. Albert on the Gaspé Peninsula.

On the Eastern White Hills, *Minuartia biflora* was discovered at a single site on the eastern rim of the tableland barrens. Only a few plants were found on patches of exposed, moist gravel on an east-facing slope above a small ravine with late-melting snow. Surprisingly, we did not encounter *M. marcescens* (Fern.) House, the rare, northeastern endemic species that is well known from the Bonne Bay and Bay of Islands serpentines.

The new record on the Great Northern Peninsula for this arctic-alpine species adds a second major, disjunct, southern outpost to the one already known on Mt. Albert in the Shickshock Mountains of the Gaspé. The historical reasons why rare vascular plants and bryophytes with arctic-alpine or Cordilleran affinities have become isolated from their main distribution areas have long been the subject of opposing theories by phytogeographers and ecologists. The question as to whether these plants survived the last glaciation as relicts in *in situ*, ice-free refugia (nunataks) around the Gulf of St. Lawrence, or whether they are post-glacial immigrants from southern or coastal refugia following ice retreat, that subsequently persisted in these unique habitats, is still open to debate (Belland et al., 1992; Bouchard et al., 1986). Their survival in narrow-niche habitats, such as these serpentine barrens, can be attributed to the extreme ecological conditions that tend to reduce competition, favoring the persistence of rare and endemic species at their range limits. Long-distance dispersal is also a possible mechanism that may explain the disjunct distribution pattern of some species.

Sagina caespitosa (J. Vahl) Lange (Syn.: *Sagina nivalis* (Lindbl.) Fries var. *caespitosa* (J. Vahl) Boivin)

SPECIMENS. Strait of Belle Isle Dist.: St. Anthony, 4–5 mi. west of town, Eastern White Hills, 1951/06/29, *Savile & Vaillancourt* 1971 (MT); 1951/08/08, *Savile & Vaillancourt* (MT).

Sagina caespitosa has a typical arctic amphi-Atlantic distribution pattern. It occurs as a coastal and montane species in the eastern Arctic of North America, radiating eastward across the Atlantic through Greenland, Iceland and Scandinavia (Crow, 1978;

Hultén, 1958; Scoggan, 1978–79). In the arctic region of the Québec-Labrador Peninsula, populations are widespread but rare (Bouchard et al., 1983; Morisset and Payette, 1987; Rousseau, 1974).

The discovery of this remarkable new *Sagina* for Newfoundland results from our revision of older herbarium sheets of collections made in 1951 from the Eastern White Hills tableland, erroneously identified as *Minuartia rubella* (Wahlenb.) Hiern. These Savile and Vaillancourt collections have only recently been made available for consultation and have escaped revision until now. The label information on the herbarium specimens gives only a vague description of the habitat as serpentine gravel barrens at 200 m alt. At the time of our foray on the tableland, we were as yet unaware of the existence of these older specimens, and we did not discover it ourselves during our own collecting.

The new record from the tip of the Northern Peninsula represents a major disjunct outlier to the south. Crow (1978) has discussed the present-day distribution patterns of the different species of *Sagina* in context of Pleistocene glaciation events. He has argued that eastern Arctic populations of *S. caespitosa* may have survived in coastal mountain refugia and cites as evidence their distinct affinity with probable nunatak populations of this species in western Greenland. He is, nonetheless, careful to point out that long distance, airborne dispersal may have played an important role, allowing species of *Sagina*, because of their dust-like diaspores, to become established in suitable habitats following glaciation.

Sagina saginoides (L.) Karst. (Syn.: *Sagina linnaei* Presl)

SPECIMENS. Strait of Belle Isle Distr.: White Hills, west of St. Anthony, southwest of Western Long Pond, 1992/08/17, *Bouchard, Hay & Brouillet 92349* (CAN, MT).

Sagina saginoides has a circumpolar distribution, correlating almost entirely with montane regions of the Northern Hemisphere. In North America, it is almost exclusively a western alpine species, ranging through the Cordillera from Alaska south to Arizona and New Mexico (Crow, 1978; Hultén and Fries, 1986). It is of rare occurrence in eastern North America, where only seven disjunct locations have been previously recorded from the arctic

and subarctic region of the Québec-Labrador Peninsula and on the Gaspé Peninsula serpentines of Mt. Albert (Bouchard et al., 1983; Crow, 1978; Morisset and Payette, 1987; Scoggan, 1978–79).

On the Eastern White Hills serpentine plateau, *Sagina saginoides* was discovered along the eastern rim of the tableland where several of the talus slopes are snow-covered until late in the season. Snowbed ecosystems have a particularly high incidence of rare plants in Newfoundland (Bouchard et al., 1991). Their special ecological conditions account for the presence of this new species and other rare, characteristic elements of arctic-alpine affinity such as *Cassiope hypnoides* (L.) D. Don, *Epilobium anagallidifolium* Lam., *E. lactiflorum* Hausskn., *Gnaphalium norvegicum* Gunn., *Phleum alpinum* L., *Salix herbacea* L., *Veronica wormskjoldii* Roem. & Schultes, and *Viola palustris* L. The populations of *Cassiope hypnoides*, *Salix herbacea* and *Viola palustris* are new records for the area, being formerly known only from more southern alpine summits in the Long Range Mountains, between the Bay of Islands and the Highlands of Saint John (Bouchard et al., 1991).

Sagina saginoides was one of the arctic-alpine species that Fernald (1925) cited as evidence of a disjunct relictual flora that may have survived glaciation in ice-free, nunatak refugia, such as the summit of Mt. Albert on the Gaspé. More recently, however, Crow (1978) has reexamined the phytogeography of this species, and he feels that, in light of today's evidence, the rare and widely isolated eastern populations in Québec and Labrador are better regarded as resulting from long distance dispersal and/or of a pleistocene fragmentation of what was once a more wide-ranging arctic-circumpolar distribution.

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INSTITUT DE RECHERCHE EN BIOLOGIE VÉGÉTALE
JARDIN BOTANIQUE DE MONTRÉAL
4101 EST, RUE SHERBROOKE
MONTRÉAL, QC, CANADA H1X 2B2